

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A one-by-one surface purification apparatus used in a manufacturing process of [[a]] semiconductor devices or [[a]] liquid crystal display devices, characterized by wherein substrates to be purified are set one-by-one, said apparatus comprising:

~~means for bringing steam into contact with and means for spraying steam onto a surface having need of purification, wherein said surface is purified~~

means for generating mist-containing saturated steam;

means for bringing said mist-containing saturated steam into contact with a surface of each of said substrates; and

means for spraying said mist-containing saturated steam onto said surface,

wherein said mist-containing saturated steam is used to purify said surface.

2. (Currently amended) A surface purification apparatus described in claim 1, characterized in that wherein said surface is one selected from [[among]] the group consisting of process surfaces from a substrate to a semiconductor device, surfaces of process apparatus and process apparatus parts, and surfaces of apparatus and apparatus parts in relation to lithographic processes.

3. (Currently amended) A surface purification apparatus described in claim 1, characterized in that wherein said surface is processed purified with said mist-containing saturated or superheated steam at a temperature of 70°C to 200°C.

4. (Currently Amended) A surface purification apparatus described in claim 1, characterized by further comprising a steam supply apparatus comprising a steam generation system, a steam-superheating system, a control system for supplied ultrapure- ultra-pure water quantity and heat amount, and a steam pressure control system, constructed with including a steam inlet and steam-spraying nozzle[[, and]] for arbitrarily switching and supplying said mist-containing saturated or superheated steam at a temperature of 70°C to 200°C under the control of a steam-superheating system.

5. (Currently Amended) A surface purification apparatus described in claim 4,

characterized in that wherein said steam supply apparatus further includes a switching system for a supply line for a solution containing a purification promotion ingredient and said ultrapure ultra-pure water supply line, and an injection pump, and comprises a system for switching steam containing said purification promotion ingredient and steam not containing said purification promotion ingredient.

6. (Cancelled) A surface purification apparatus described in claim 1, characterized by comprising irradiation means for irradiating with ultraviolet rays, wherein said surface is processed in combination with processing of irradiating said surface with ultraviolet rays in said steam processing.

7. (Cancelled) A surface purification apparatus described in claim 6, characterized in that said irradiation means uses an ultraviolet lamp of a wavelength corresponding to a 50% transmissive distance of not less than 10 mm to steam.

8. (Amended) A one-by-one surface purification apparatus ~~characterized in that a system for introducing steam, and a drive system in which a spraying surface is swept by a steam spraying nozzle moving relatively to a surface being processed, are providing in a chamber including a substrate take in/out system and an atmosphere discharge system, and said steam spraying nozzle sprays steam onto said surface having substrates to be purified set one-by-one, comprising:~~

means for generating mist-containing saturated steam; and
a chamber;
said chamber comprising:
an atmosphere discharge system;
means for bringing said mist-containing saturated steam into contact with a surface of each
of said substrates; and
means for spraying said mist-containing saturated steam onto said surface,
wherein said mist-containing saturated steam is used to purify said surface.

9. (Cancelled) A surface purification apparatus described in claim 1, characterized in that an ultraviolet reactor comprising an ultraviolet lamp of a wavelength corresponding to a 50% transmissive distance of not less than 10 mm to steam, is accompanied, said ultraviolet lamp is

disposed in parallel with said surface, and said surface in steam processing is irradiated and processed.

10. (Currently amended) ~~A surface purification apparatus described in claim 8, characterized in that A one-by-one surface purification apparatus having substrates to be purified set one-by-one, comprising:~~

means for generating saturated steam;

means for generating superheated steam; and

a chamber;

said chamber comprising:

an atmosphere discharge system;

means for bringing at least one of said saturated steam and said superheated steam into contact with a surface of each of said substrates; and

means for spraying at least one of said saturated steam and said superheated steam onto said surface,

wherein said atmosphere discharge system further comprises a suction system, and the surface being processed is dried by discharging the atmosphere in the chamber after superheated steam processing, and

wherein at least one of said saturated steam and superheated steam is selectively used to purify said surface.

11. (Currently amended) ~~A one-by-one surface purification method surface purification method used in a manufacturing process of [[a]] semiconductor devices [[a]] or liquid crystal display devices, characterized in that, by using a process for bringing steam into contact with a surface having need of purification, said surface is processed~~

wherein substrates to be purified are set one by one, said method comprising the steps of:

generating mist-containing saturated steam;

bringing said mist-containing saturated steam into contact with a surface of each of said substrates; and

spraying said mist-containing saturated steam onto said surface,
wherein said mist-containing saturated steam is used to purify said surface.

12. (Currently amended) A surface purification method described in claim 11, characterized in that wherein said surface is one selected from [[among]] the group consisting of process surfaces from a substrate to a semiconductor device, surfaces of process apparatus and process apparatus parts, and surfaces of apparatus and apparatus parts in relation to lithographic processes.

13. (Currently amended) A surface purification method described in claim 11, characterized in that wherein said surface is processed with said mist-containing saturated ~~or superheated~~ steam at a temperature of 70°C to 200°C.

14. (Cancelled) A surface purification method described in claim 11, characterized in that said surface is processed in combination with processing of irradiating said surface with ultraviolet rays of a wavelength corresponding to a 50% transmissive distance of not less than 10 mm to steam, in said steam process.

15. (Cancelled) A surface purification method described in claim 14, characterized in that organic matters having adhered to said surface are removed by said steam processing and said process of irradiating with ultraviolet rays.

16. (Cancelled) A surface purification method described in claim 14, characterized in that an organic matter film formed on said surface is removed by said steam processing and said processing and said process of irradiating with ultraviolet rays.

17. (Cancelled) A surface purification method described in claim 14, characterized in that particles having adhered to said surface are removed by said steam processing and said process of irradiating with ultraviolet rays.

18. (Currently amended) A surface purification method described in claim 13, characterized in that wherein generation of water marks is staved off by discharging the atmosphere in the chamber after superheated steam processing of said surface, and drying the surface being processed.

19. (Currently amended) A surface purification method described in claim 11, characterized in that A one-by-one surface purification method used in a manufacturing process of semiconductor devices or liquid crystal display devices, wherein substrates to be purified are set one by one, said method comprising the steps of:

generating saturated steam;

generating superheated steam;

bringing at least one of said saturated steam and said superheated steam into contact with a surface of each of said substrates; and

spraying at least one of said saturated steam and said superheated steam onto said surface,

wherein said surface is a silicon substrate, and said silicon surface is made to be a hydrogen termination structure by steam-processing silicon exposed on said silicon substrate surface such that the peak ratios of Si-O/Si-H are at most 0.05, and

wherein at least one of said saturated steam and superheated steam is used as said steam to purify said surface.